

Epidemiology of cancer

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3.1 Introduction

Cancer epidemiology is the study of the pattern of cancer in populations and is predominantly statistical, its methods and conclusions being expressed in terms of probabilities; for example, 'Japanese women have less than a quarter the breast cancer risk of US women' or 'women who have a baby before age 20 have only half the chance of getting breast cancer of women without children'. Its primary objective, in the area of public health, is to identify preventable (avoidable) causes of cancer, but it also has an important role in other areas of cancer research; for example, in the evaluation of screening tests to detect cancer at an early stage and in aiding the understanding of the mechanistic basis of cancer.

The most basic task of cancer epidemiology is simply to describe the occurrence of human cancer, noting differences between, for example, males and females, people of different ages, different socioeconomic classes, people in different occupations, different time periods, different areas of a country, and different countries. This descriptive epidemiology has been a most fruitful source of ideas as to the possible causes of various cancers. For example, the enormous rise of lung cancer in men, but not in women, between 1920 and 1945 suggested that some recently introduced habit of men, but not of women, must be responsible, and cigarette smoking

became the prime candidate. More recently the finding of large differences in the occurrence of colorectal cancer between different countries has led to intense investigation of the possible roles of various aspects of the normal diet (such as fat or fibre content) as factors in the aetiology of this cancer.

3.2 Descriptive epidemiology

3.2.1 Incidence rates

To describe the differences in occurrence of a particular cancer between different groups the most useful concept is that of an incidence rate—the probability of an individual in a particular group being newly diagnosed as having the particular cancer within a year. In epidemiological studies these probabilities are usually expressed as a rate usually 'per 100 000' or 'per million'. For example, the incidence rate of breast cancer in females in England and Wales in 1989 was 107.2 per 100 000; this was estimated by noting that there were 25 893 400 females in England and Wales on 30 June 1989 and that 27 768 new breast cancer cases were diagnosed in females in that year: $27\,768 / 25\,893\,400 = 0.001072$ or 107.2 per 100 000.

3.2.2 Age-specific incidence rates

For most forms of cancer the incidence rate increases rapidly with increasing age. For aetiological

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